REMARKS

This Amendment is responsive to the Office Action mailed December 20, 2004. The Examiner's comments in this Action have been carefully considered. Applicants request an extension of time of one month to reset the term for response from March 20 to April 20, 2005, and the U.S. Patent Office is authorized to charge the extension fee to our account no. 10-0100.

Claims 1-7 and 10 have been rejected as being being obvious on the basis of U.S. Patent 5,828,763 to Koyano et al., for reasons set forth in paragraph 3, which starts on page 2 of the Action. The Examiner has indicated, however, that claims 8 and 9 have merely been objected to, and would be allowed if rewritten in independent form.

In order to overcome the Examiner's objections and to place the application in better condition for allowance, claims 8 and 9 have been canceled without prejudice and rewritten as new claims 11 and 12, which should now be in condition for allowance.

The rejections of claims 1-7 and 10 are respectfully traversed, and the Examiner is respectfully asked to reconsider and withdraw this rejection in light of the clarifications made in the claims and on the basis of the arguments submitted below.

Amended claim 1 clearly defines and requires at least two loudspeakers (2, 3). One of these loudspeakers (3) is preceded by a low pass frequency filter (4) and the other by a phase shifter (5). The phase shifter is placed in front of the loudspeaker (2) and radiates low as well as medium frequency tones, and is set so that the low frequency tones emanating from at least one other loudspeaker (2) have substantially the same phase as the low frequency tones emanating from said at least one loudspeaker (3). In this manner, the low frequency tones emanating from these speakers

reinforce each other and enhance the volume of low frequency tones. The other rejected claims depend directly or indirectly on amended claim 1 and address different, more specific combinations of the invention. It is respectfully submitted that if claim 1 is allowable, the remaining rejected claims 2-7 and 10 should also be allowed.

Turning to the prior art rejection, the Examiner recognizes that the applied reference shows a loudspeaker combination with a high pass frequency filter output and fails to show or teach the use of a low pass frequency filter output as required by the present invention. The Examiner states, however, that it is old and well-known in the audio art to use different frequency filters, and that it is common in the art to provide for a signal compensation with a low frequency sound wave phase shift to reproduce an improved high fidelity sound field with both low and high frequency signal phase shift compensation. The Examiner's observation herein is believed to be in error.

The use of a low pass filter in the present invention is an important, even critical, aspect of the invention. Thus, the use of a high pass filter in the reference to Koyano et al. creates an equal radiation of sound in all directions for mid and high frequencies as is shown in Figs. 5 and 6 of the reference. The reason for this sound distribution is explained in the reference, at column 2, lines 17–27.

> A sensitivity of the sound in the mid- and high-frequency ranges, which results from the combination of the sound waves radiated from both the speakers, decreases on the principal axis of the speaker system because those sound waves, phase-shifted, interact with each other. The phases of the sound waves also become different on both sides of the principal axis of the speaker system. Owing to a difference between the travelling paths of

the sound shift caused by the phase shifter, the interaction of the phase-shifted sound waves causes the combined sound wave to increase mid- and high-frequency ranges.

In Koyano et al. the change of phase is in the range of 0 to 140 degrees in such a way that the speakers have phase differences of up to 140 degrees. The result, shown in Fig. 6 of the reference, is that the wave distributions are substantially uniform in every direction. But this uniform distribution in every direction is not an objective of the subject invention.

In the present invention, the objective is not so much to enhance the quality of the audio signal as it is to provide frequency compensation and magnify or enhance the low frequency tones or frequencies. It is certainly well known to those skilled in the art that speakers for low frequencies need large membranes or vibrating surface areas to provide the sufficient loudness. Speakers with such membranes or surface areas, however, are expensive. Hence, the present invention shows how speakers with smaller membranes can effectively provide the same benefits as speakers with larger membranes. Because smaller speakers are less expensive than one expensive speaker with large membrane, two or more smaller speakers with small membranes can be used to obtain enhanced, magnified amplitudes of the low frequency tones.

With this invention, substantially the same volume in low or base frequencies can be achieved if all the speakers generate the same low frequencies in phase with each other. Clearly, if the frequencies emanating from each speaker are low but out of phase, they will tend to cancel each other and negate the benefit that the present invention proposes. But because suitable phase shifters are used to adjust the phase shifts of the low frequencies emanating from the speakers to correspond with the phase of the others, their cumulative low frequency output is additive and not

counterproductive. The outputs reinforce each other to provide the effect of one virtual loudspeaker with a large membrane.

It should be clear that the inventions in Koyano et al. and in the subject invention are entirely different. There is no discussion or suggestion in the reference that a low-frequency filter should be used to achieve the desired result. Thus, whereas those skilled in the art certainly know that there are different frequency filters available for use, it is by no means obvious that one type of filter be replaced with another in order to achieve the effect of the first filter. There is no incentive for one skilled in the art to change the applied reference in the direction of the present invention, and it would not be obvious to do so.

It is respectfully submitted that claim 1, as amended, clearly distinguishes over the Koyano et al. reference. Reconsideration of the rejection and allowance of all of the claims is, accordingly, respectfully solicited.

It is believed that this application is now in condition for allowance. Early allowance and issuance is therefore respectfully solicited.

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